

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Jean-Christophe REMIGY et al.

Serial No. (unknown)

Filed herewith

METHOD FOR PRODUCING A NANO-  
FILTRATION MEMBRANE AND  
RESULTING MEMBRANE

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee, please amend  
the above-identified application as follows:

IN THE CLAIMS:

Amend claim 3 as follows:

3. (amended) The method as claimed in claim 1, wherein  
the supporting membrane (3,9) contains at least one  
photosensitive agent chosen from the group formed of polysulfones  
and their derivatives - in particular polysulfone,  
(polymethylsulfone), polyaryl sulfones and polyethersulfone -  
aromatic polyketones, polyphenylene oxides, aromatic polyimides,  
polyetherketones, and copolymers and mixtures of polymers  
containing at least one photosensitive agent chosen from the  
group formed of polysulfones or of their derivatives, aromatic

polyketones, polyphenylene oxides, aromatic polyimides and polyetherketones.

Amend claim 4 as follows:

4. (amended) The method as claimed in claim 1, wherein the supporting membrane (3,9) consists substantially of at least one photosensitive polymer.

Amend claim 6 as follows:

6. (amended) The method as claimed in claim 1, wherein the grafting composition contains at least one grafting monomer containing in its formula at least one unsaturated covalent bond, in particular at least one carbon-carbon double bond, and at least one crosslinking agent including in its formula at least two unsaturated covalent bonds, in particular at least two carbon-carbon double bonds.

Amend claim 7 as follows:

7. (amended) The method as claimed in claim 1, wherein the grafting composition contains at least one vinyl grafting monomer.

Amend claim 8 as follows:

8. (amended) The method as claimed in claim 1, wherein the grafting composition contains at least one grafting monomer chosen from the group comprising acrylic acid; acrylamide; methacrylic acid and their acrylate, methacrylate and acrylamide derivatives; vinyl pyridines and their alkyl or carbazole derivatives; maleic anhydride; vinyl acetates; vinyl sulfonic

acid; vinyl phosphoric acid; 4-styrene sulfonic acid; N-vinyl pyrrolidone.

Amend claim 9 as follows:

9. (amended) The method as claimed in claim 1, wherein the grafting composition includes at least one crosslinking agent chosen from the group of acrylates, methacrylates and difunctional acrylamides.

Amend claim 11 as follows:

11. (amended) The method as claimed in claim 1, wherein light radiation is applied with a wavelength or wavelengths of between 200 nm and 600 nm, so as to deliver light energy of between 0.1 J/cm<sup>2</sup> and 300 J/cm<sup>2</sup>, preferably between 0.7 and 160 J/cm<sup>2</sup>.

Amend claim 12 as follows:

12. (amended) The method as claimed in claim 1, wherein the supporting membrane (3,9) and the grafting monomer(s) of the grafting composition are chosen such that the photosensitive agent(s) has/have an absorption spectrum in a wavelength region where the grafting monomer(s) has/have substantially no absorption, and light radiation is chosen that does not emit outside this region.

Amend claim 13 as follows:

13. (amended) The method as claimed in claim 1, wherein light radiation is applied with a wavelength or wavelengths situated outside the absorption region of the

grafting monomer(s) of the grafting composition.

Amend claim 14 as follows:

14. (amended) The method as claimed in claim 1, wherein light radiation is applied with a wavelength or wavelengths above 300 nm.

Amend claim 15 as follows:

15. (amended) The method as claimed in claim 1, wherein an ultraviolet lamp (5,11) is used surrounded by a glass tube capable of filtering out wavelengths below 300 nm.

Amend claim 16 as follows:

16. (amended) The method as claimed in claim 1, wherein the grafting composition contains between 1% and 10% by mass, in particular of the order of 2.5% by mass, of a grafting monomer or monomers.

Amend claim 17 as follows:

17. (amended) The method as claimed in claim 1, wherein the grafting composition contains a quantity of crosslinking agent(s) of between 0,1 molar % and 10 molar % of the quantity of grafting monomer.

Amend claim 18 as follows:

18. (amended) The method as claimed in claim 1, wherein, in order to put the grafting face (12,30) into the presence of the grafting composition, the supporting membrane (3,9) is immersed in a bath (2,10) of the grafting composition in the form of a deoxygenated liquid solution.

Amend claim 19 as follows:

19. (amended) The method as claimed in claim 1, wherein light radiation is applied while the grafting face (12, 30) is immersed in a bath (2, 10) of grafting composition.

Amend claim 20 as follows:

20. (amended) The method as claimed in claim 1, wherein the grafting face (12, 30) is immersed in a bath of the grafting composition, is then withdrawn from this bath and light radiation is then applied.

Amend claim 23 as follows:

23. (amended) The membrane according to claim 21, wherein the supporting membrane (3,9) is a microporous or mesoporous membrane consisting substantially of at least one polymer chosen from the group formed of polysulfones and their derivatives - in particular polysulfone (polymethylsulfone), polyarylsulfones and polyethersulfone - aromatic polyketones, polyphenylene oxides, aromatic polyimides, polyetherketones, and copolymers and mixtures of polymers containing at least one photosensitive agent chosen from the group formed of polysulfones or their derivatives, aromatic polyketones, polyphenylene oxides, aromatic polyimides and polyetherketones.

Amend claim 24 as follows:

24. (amended) The membrane as claimed in claim 21, wherein the graft of a crosslinked polymer or polymers is formed of at least one vinyl polymer.

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Amend claim 26 as follows:

26. (amended) The membrane as claimed in claim 21,  
wherein it is in the form of a hollow fibre.

R E M A R K S

Attached hereto is a marked-up version of the changes made to the claims. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

3. The method as claimed in [either of claims 1 or 2] claim 1, wherein the supporting membrane (3,9) contains at least one photosensitive agent chosen from the group formed of polysulfones and their derivatives - in particular polysulfone, (polymethysulfone), polyaryl sulfones and polyethersulfone - aromatic polyketones, polyphenylene oxides, aromatic polyimides, polyetherketones, and copolymers and mixtures of polymers containing at least one photosensitive agent chosen from the group formed of polysulfones or of their derivatives, aromatic polyketones, polyphenylene oxides, aromatic polyimides and polyetherketones.

4. The method as claimed in [one of claims 1 to 3] claim 1, wherein the supporting membrane (3,9) consists substantially of at least one photosensitive polymer.

6. The method as claimed in [one of claims 1 to 5] claim 1, wherein the grafting composition contains at least one grafting monomer containing in its formula at least one unsaturated covalent bond, in particular at least one carbon-carbon double bond, and at least one crosslinking agent including in its formula at least two unsaturated covalent bonds, in particular at least two carbon-carbon double bonds.

7. The method as claimed in [one of claims 1 to 6] claim 1, wherein the grafting composition contains at least one

vinyl grafting monomer.

8. The method as claimed in [one of claims 1 to 7] claim 1, wherein the grafting composition contains at least one grafting monomer chosen from the group comprising acrylic acid; acrylamide; methacrylic acid and their acrylate, methacrylate and acrylamide derivatives; vinyl pyridines and their alkyl or carbazole derivatives; maleic anhydride; vinyl acetates; vinyl sulfonic acid; vinyl phosphoric acid; 4-styrene sulfonic acid; N-vinyl pyrrolidone.

9. The method as claimed in [one of claims 1 to 8] claim 1, wherein the grafting composition includes at least one crosslinking agent chosen from the group of acrylates, methacrylates and difunctional acrylamides.

11. The method as claimed in [one of claims 1 to 10] claim 1, wherein light radiation is applied with a wavelength or wavelengths of between 200 nm and 600 nm, so as to deliver light energy of between 0.1 J/cm<sup>2</sup> and 300 J/cm<sup>2</sup>, preferably between 0.7 and 160 J/cm<sup>2</sup>.

12. The method as claimed in [one of claims 1 to 11] claim 1, wherein the supporting membrane (3,9) and the grafting monomer(s) of the grafting composition are chosen such that the photosensitive agent(s) has/have an absorption spectrum in a wavelength region where the grafting monomer(s) has/have substantially no absorption, and light radiation is chosen that does not emit outside this region.

13. The method as claimed in [one of claims 1 to 12] claim 1, wherein light radiation is applied with a wavelength or wavelengths situated outside the absorption region of the grafting monomer(s) of the grafting composition.

14. The method as claimed in [one of claims 1 to 13] claim 1, wherein light radiation is applied with a wavelength or wavelengths above 300 nm.

15. The method as claimed in [one of claims 1 to 14] claim 1, wherein an ultraviolet lamp (5,11) is used surrounded by a glass tube capable of filtering out wavelengths below 300 nm.

16. The method as claimed in [one of claims 1 to 15] claim 1, wherein the grafting composition contains between 1% and 10% by mass, in particular of the order of 2.5% by mass, of a grafting monomer or monomers.

17. The method as claimed in [one of claims 1 to 16] claim 1, wherein the grafting composition contains a quantity of crosslinking agent(s) of between 0,1 molar % and 10 molar % of the quantity of grafting monomer.

18. The method as claimed in [one of claims 1 to 17] claim 1, wherein, in order to put the grafting face (12,30) into the presence of the grafting composition, the supporting membrane (3,9) is immersed in a bath (2,10) of the grafting composition in the form of a deoxygenated liquid solution.

19. The method as claimed in [one of claims 1 to 18] claim 1, wherein light radiation is applied while the grafting

face (12, 30) is immersed in a bath (2, 10) of grafting composition.

20. The method as claimed in [one of claims 1 to 19] claim 1, wherein the grafting face (12, 30) is immersed in a bath of the grafting composition, is then withdrawn from this bath and light radiation is then applied.

23. The membrane according to [either of claims 21 or 22] claim 21, wherein the supporting membrane (3,9) is a microporous or mesoporous membrane consisting substantially of at least one polymer chosen from the group formed of polysulfones and their derivatives - in particular polysulfone (polymethylsulfone), polyarylsulfones and polyethersulfone - aromatic polyketones, polyphenylene oxides, aromatic polyimides, polyetherketones, and copolymers and mixtures of polymers containing at least one photosensitive agent chosen from the group formed of polysulfones or their derivatives, aromatic polyketones, polyphenylene oxides, aromatic polyimides and polyetherketones.

24. The membrane as claimed in [one of claims 21 to 23] claim 21, wherein the graft of a crosslinked polymer or polymers is formed of at least one vinyl polymer.

26. The membrane as claimed in [one of claims 21 to 25] claim 21, wherein it is in the form of a hollow fibre.